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Figure 1

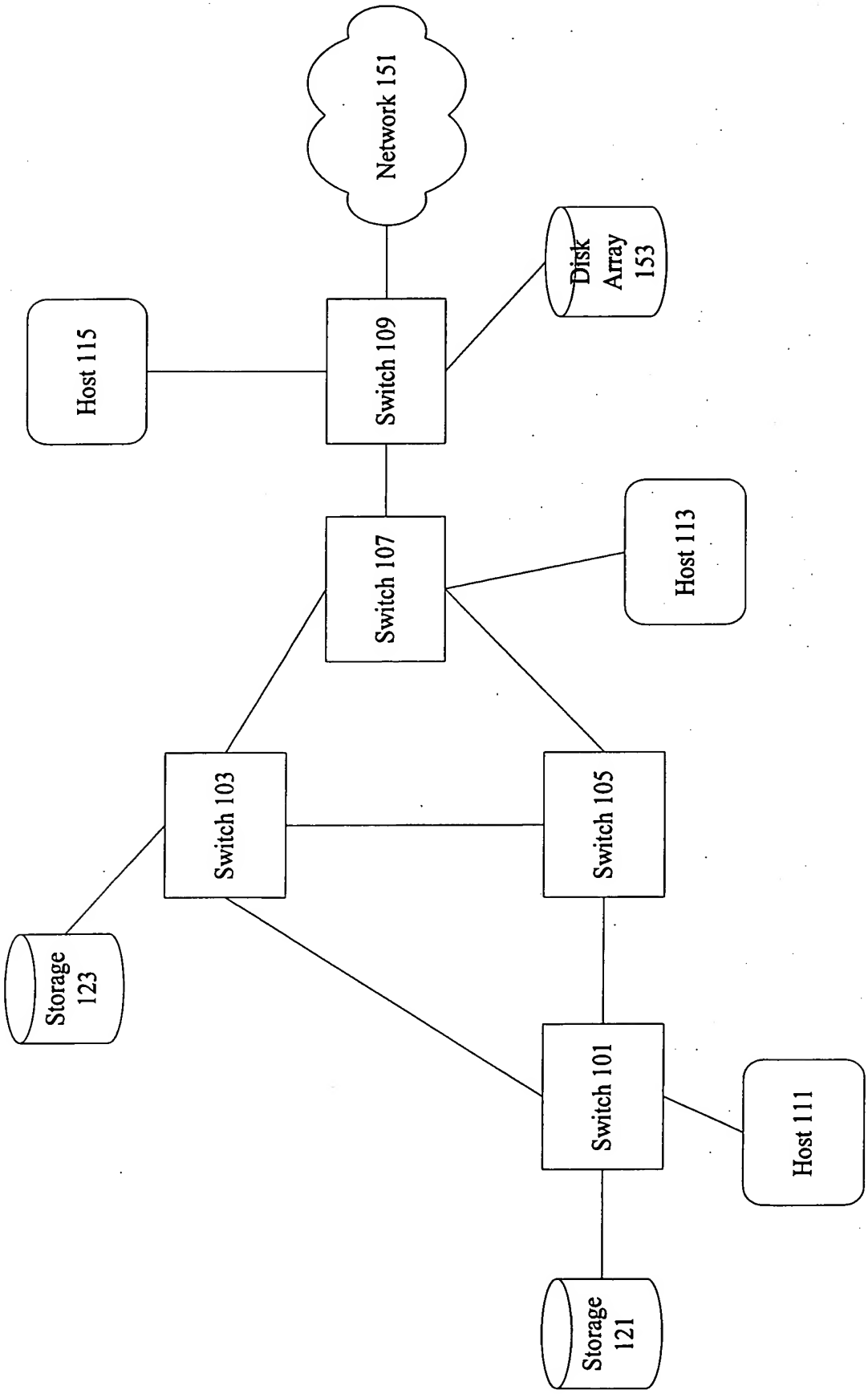

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Figure 2

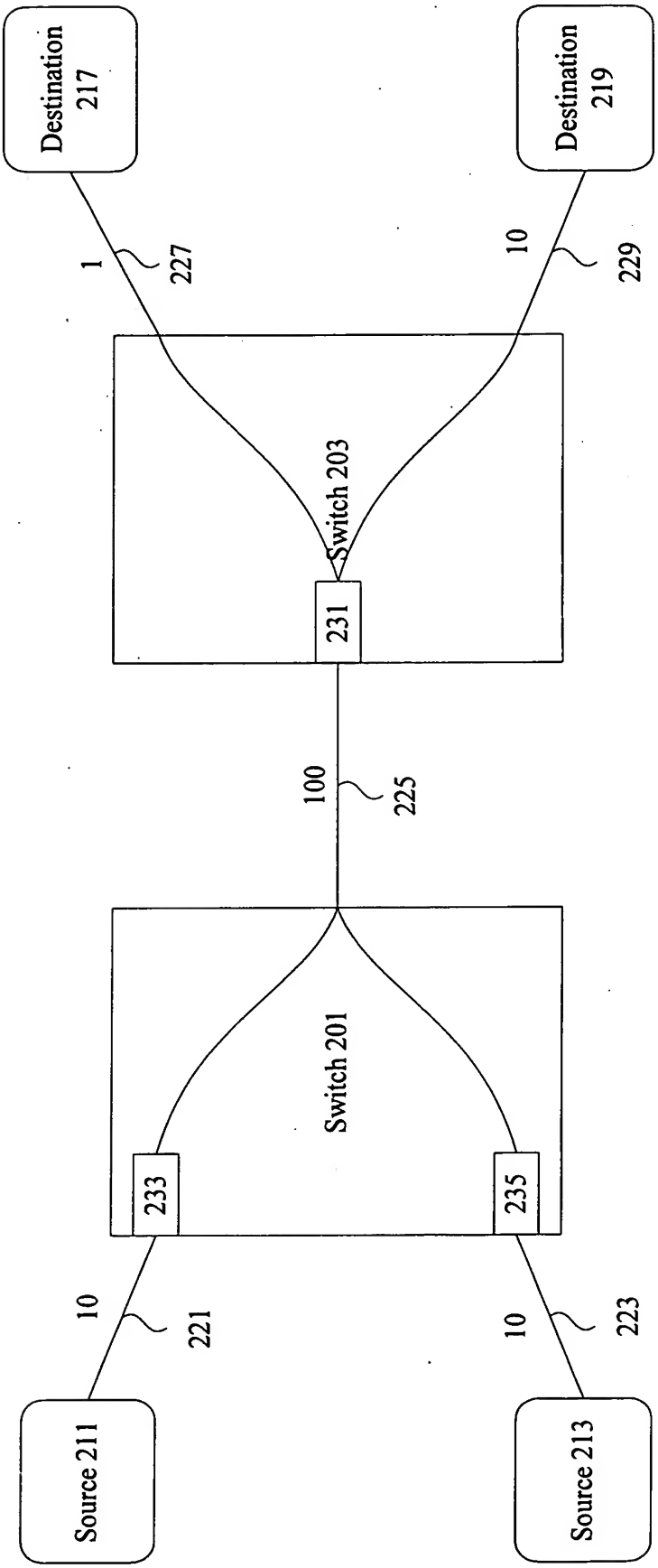
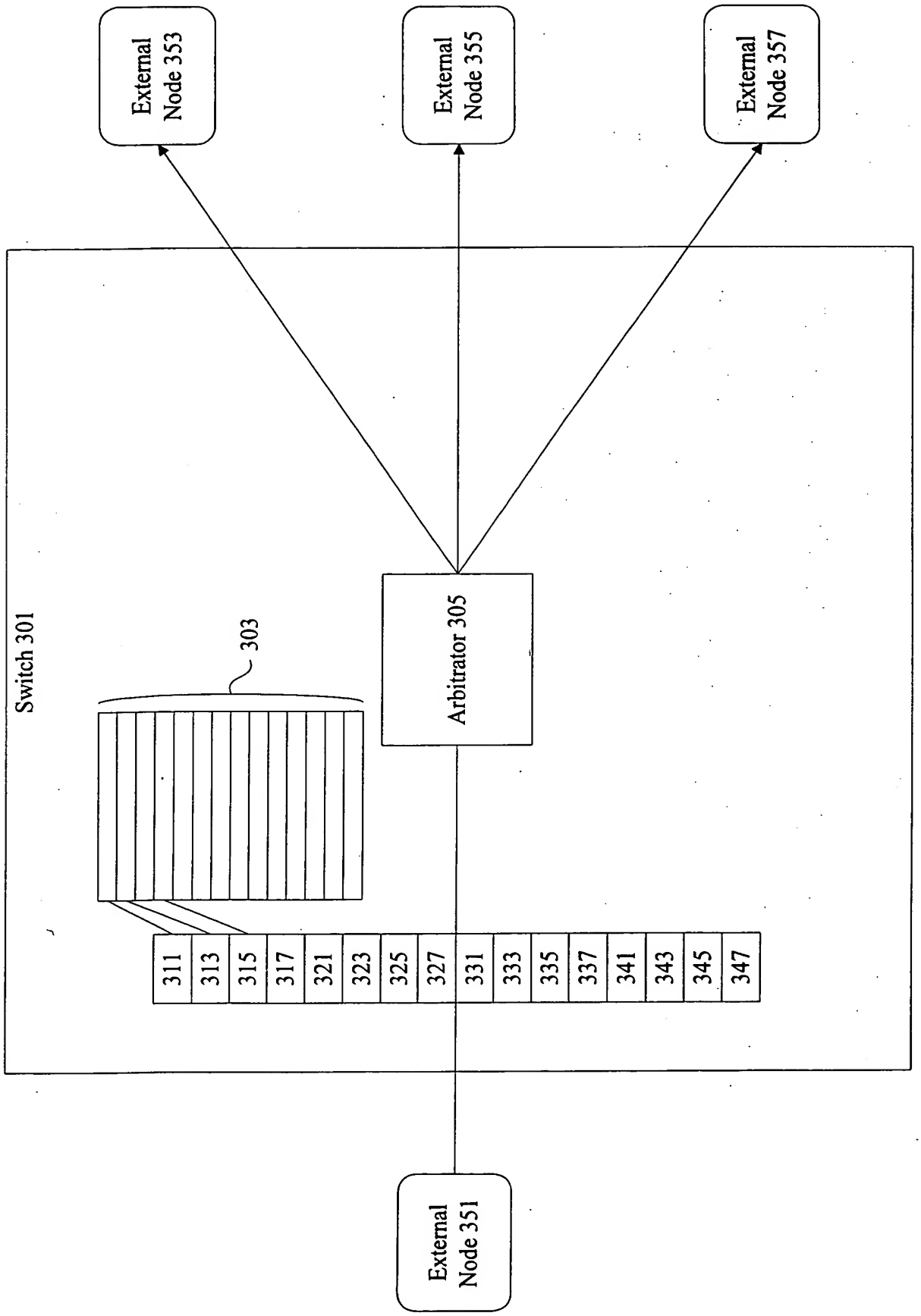


Figure 3A


External Node 353
External Node 355
External Node 357
Switch 301
303
Arbitrator 305
311
313
315
317
321
323
325
327
331
333
335
337
341
343
345
347
External Node 351

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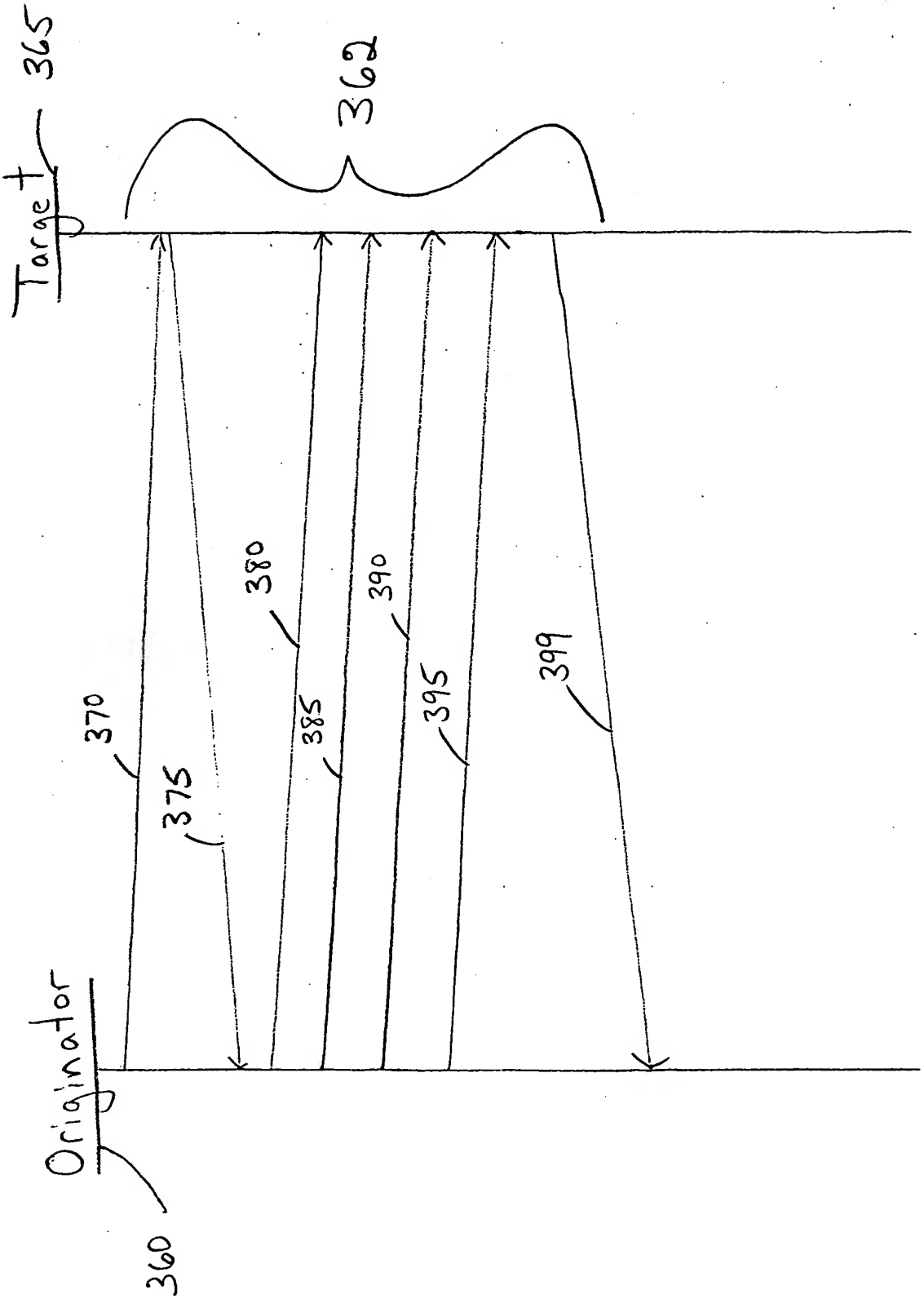
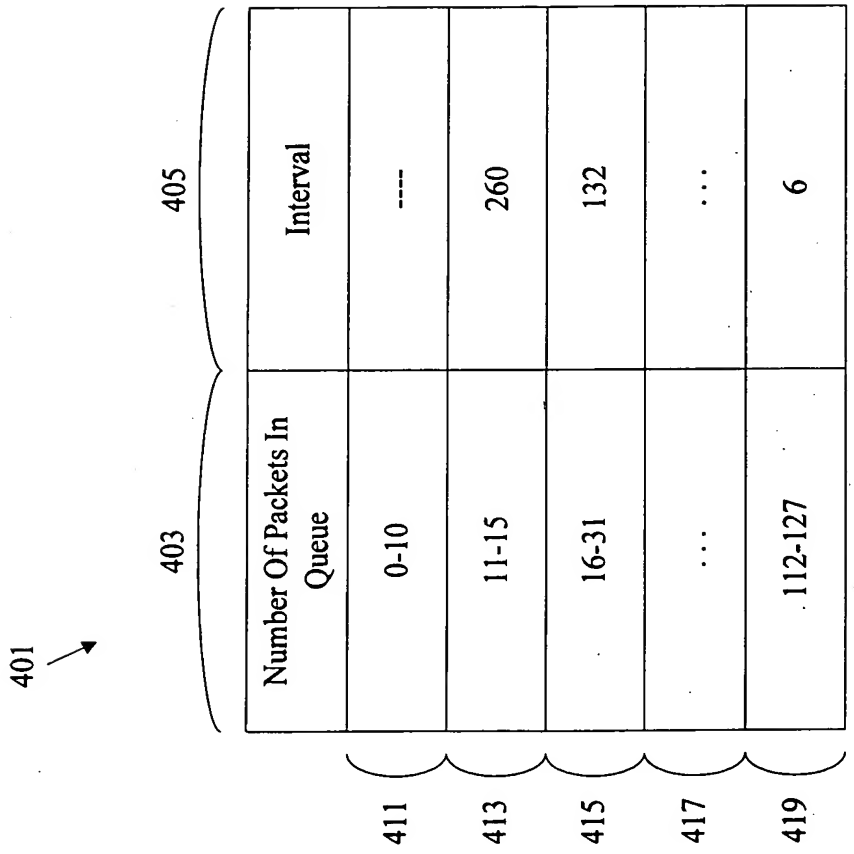


Fig. 3B

Figure 4


401
403
405
Number Of Packets In Queue
Interval
0-10

11-15
260
16-31
132
...
...
112-127
6
411
413
415
417
419

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Figure 5

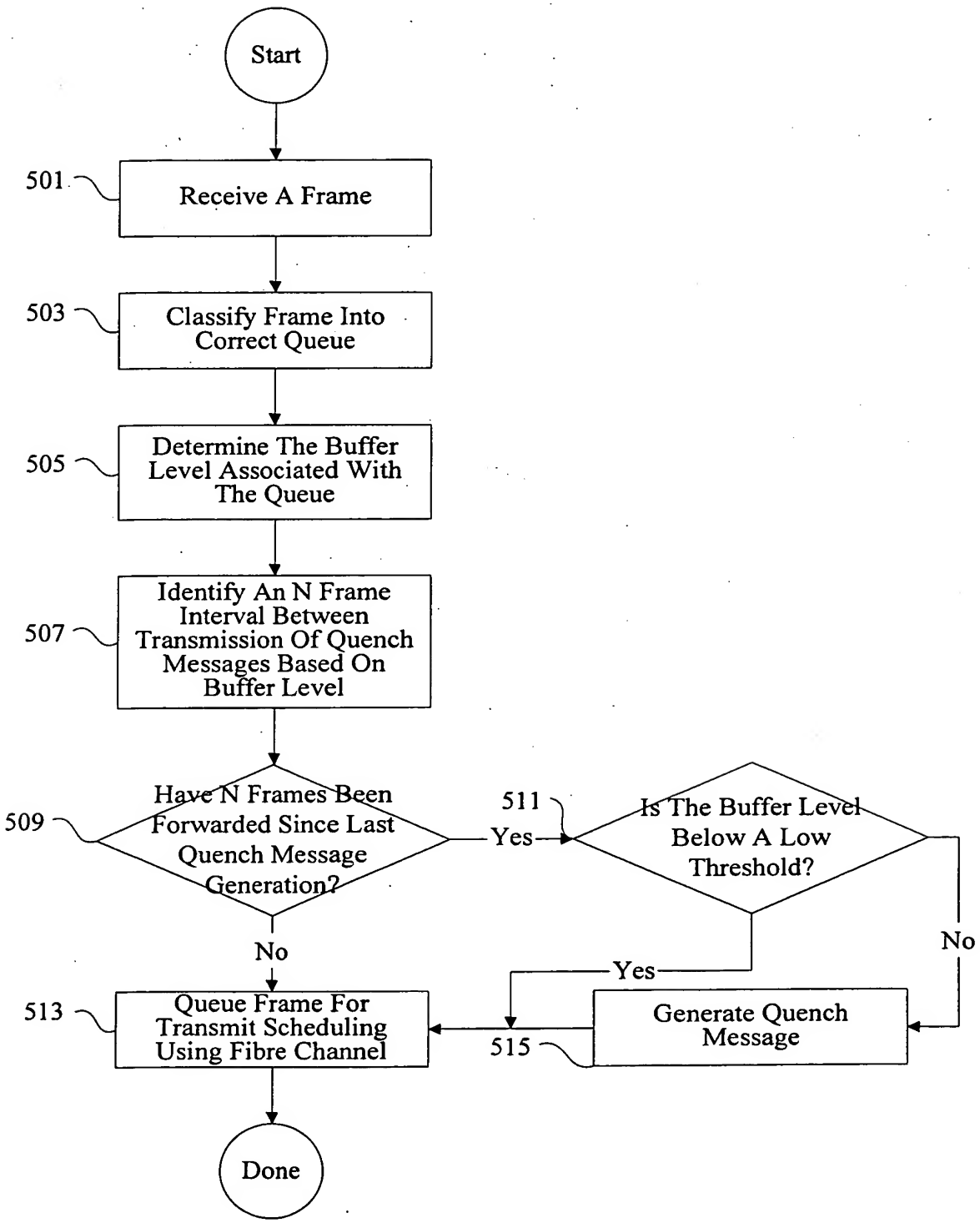

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Figure 6

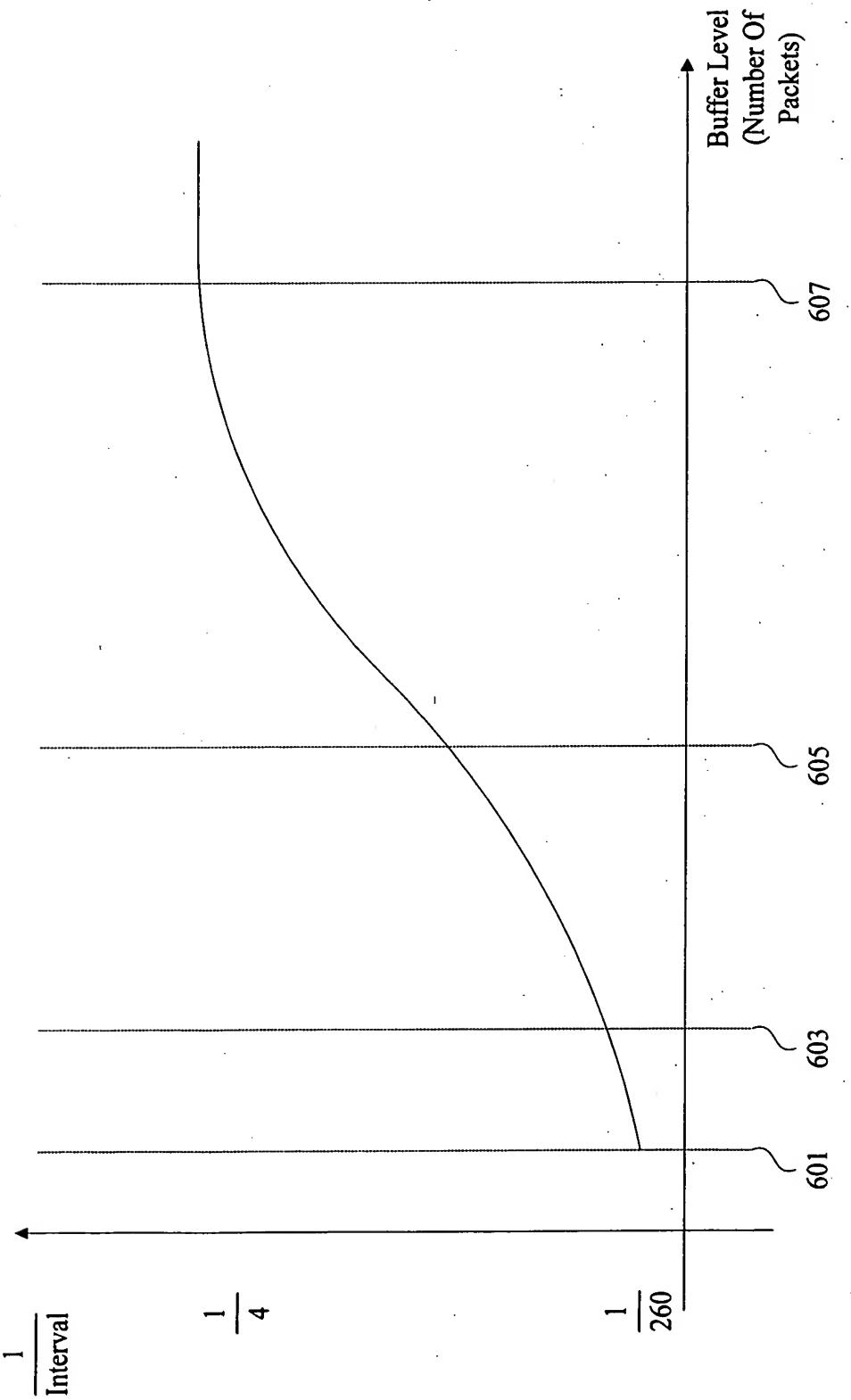

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Figure 7

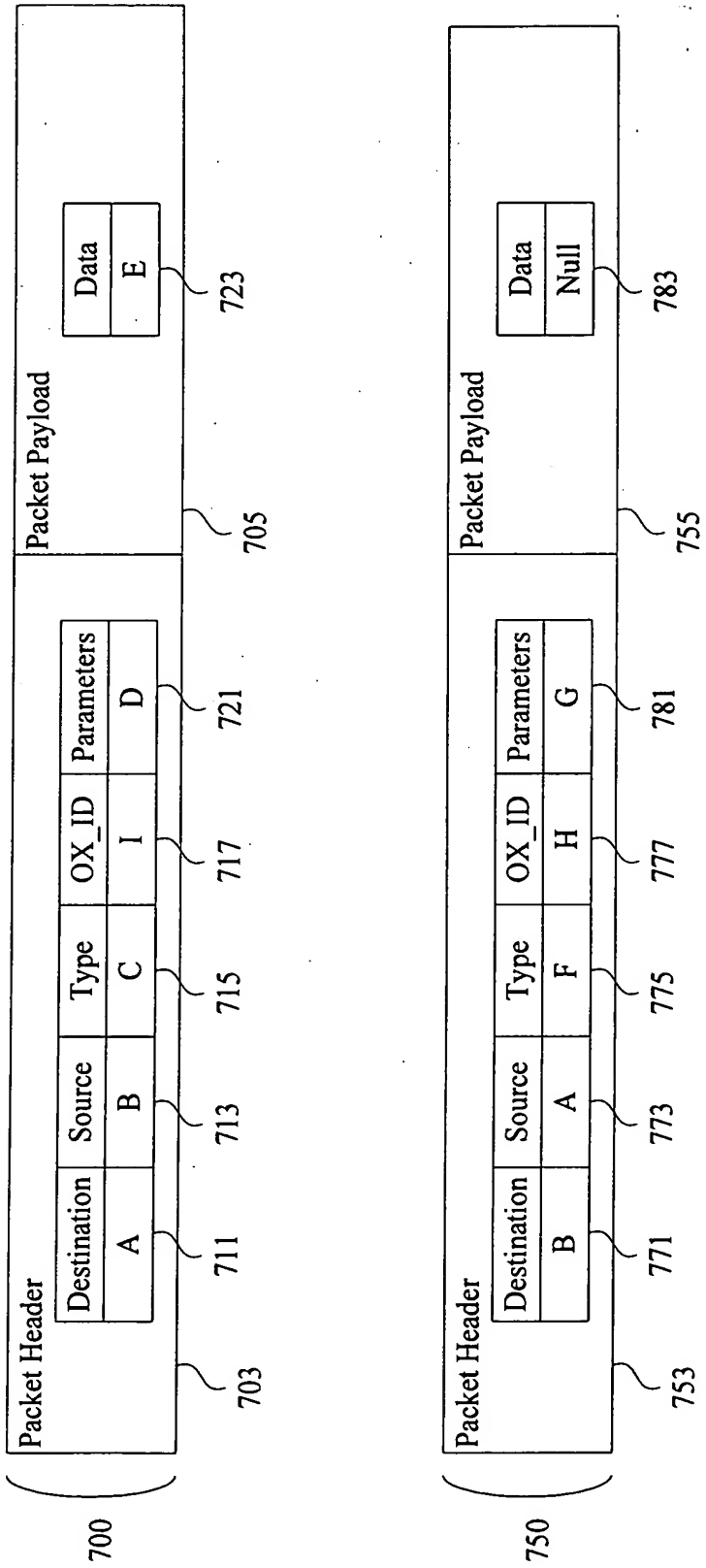

Figure 8

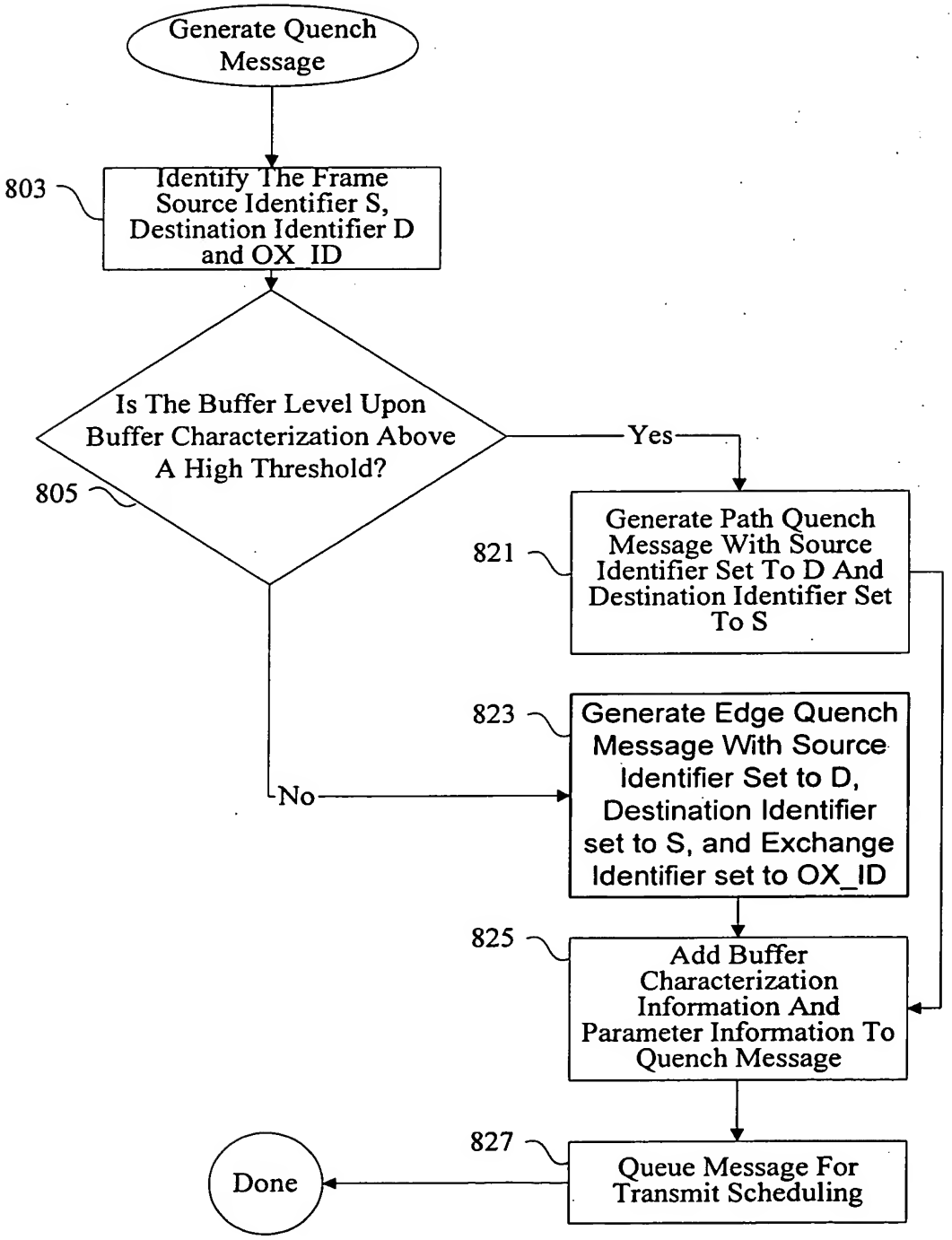
Generate Quench Message
803
Identify The Frame Source Identifier S, Destination Identifier D and OX_ID
Is The Buffer Level Upon Buffer Characterization Above A High Threshold?
805
Yes
No
821
Generate Path Quench Message With Source Identifier Set To D And Destination Identifier Set To S
823
Generate Edge Quench Message With Source Identifier Set to D, Destination Identifier set to S, and Exchange Identifier set to OX_ID
825
Add Buffer Characterization Information And Parameter Information To Quench Message
827
Queue Message For Transmit Scheduling
Done

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Figure 9

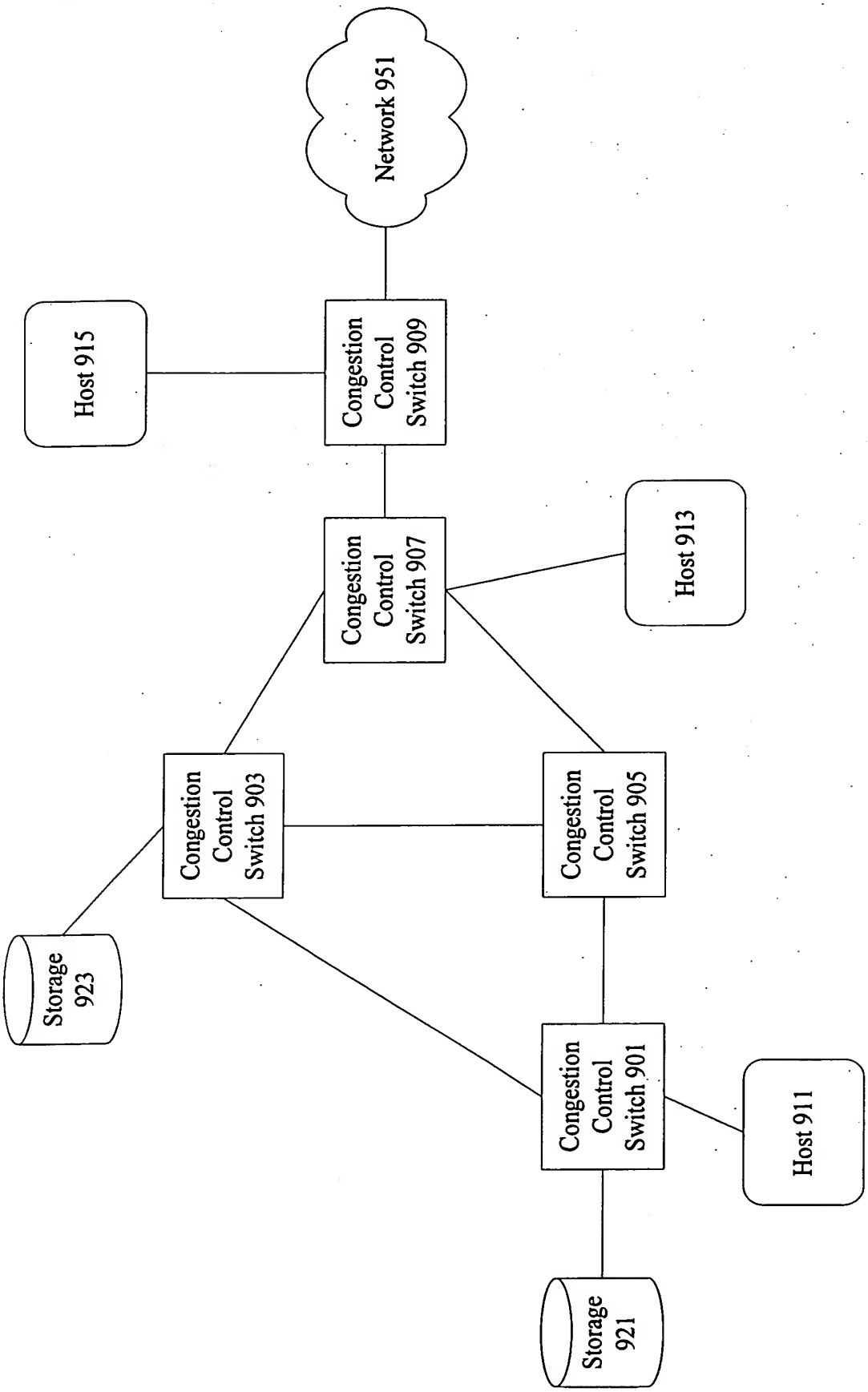


Figure 10

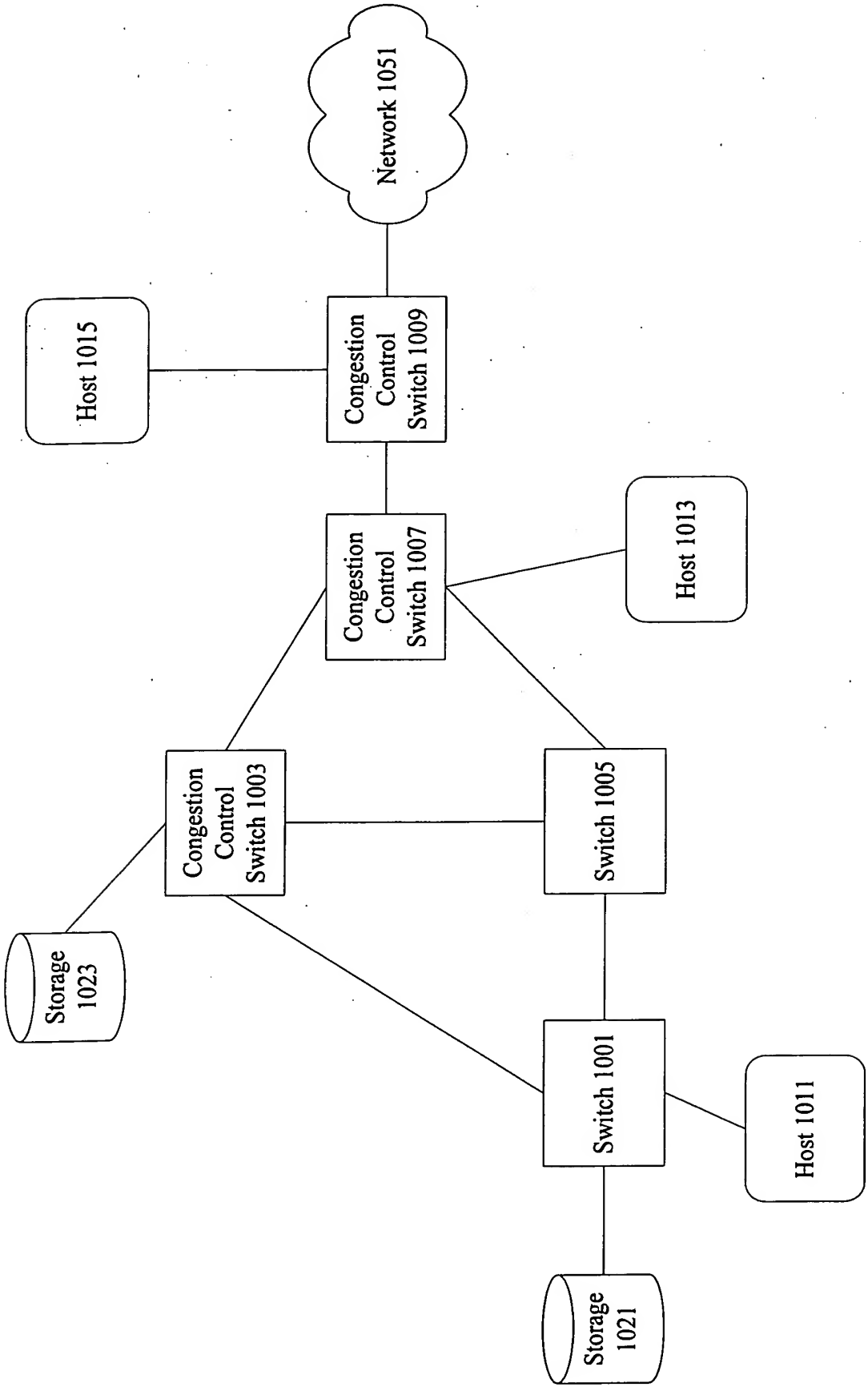

Network 1051
Host 1015
Congestion Control Switch 1009
Congestion Control Switch 1007
Host 1013
Congestion Control Switch 1003
Switch 1005
Storage 1023
Switch 1001
Host 1011
Storage 1021

Figure 11

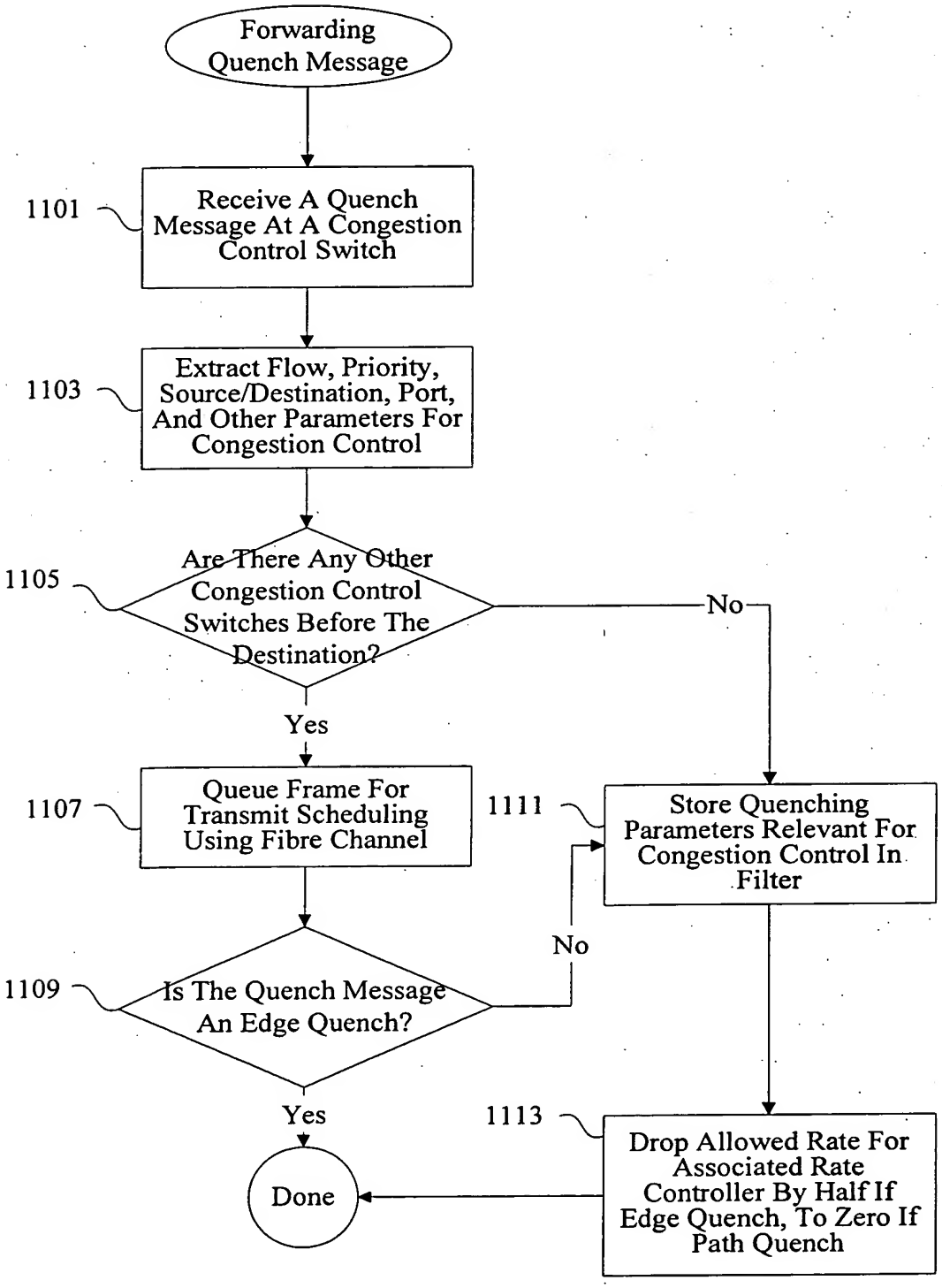
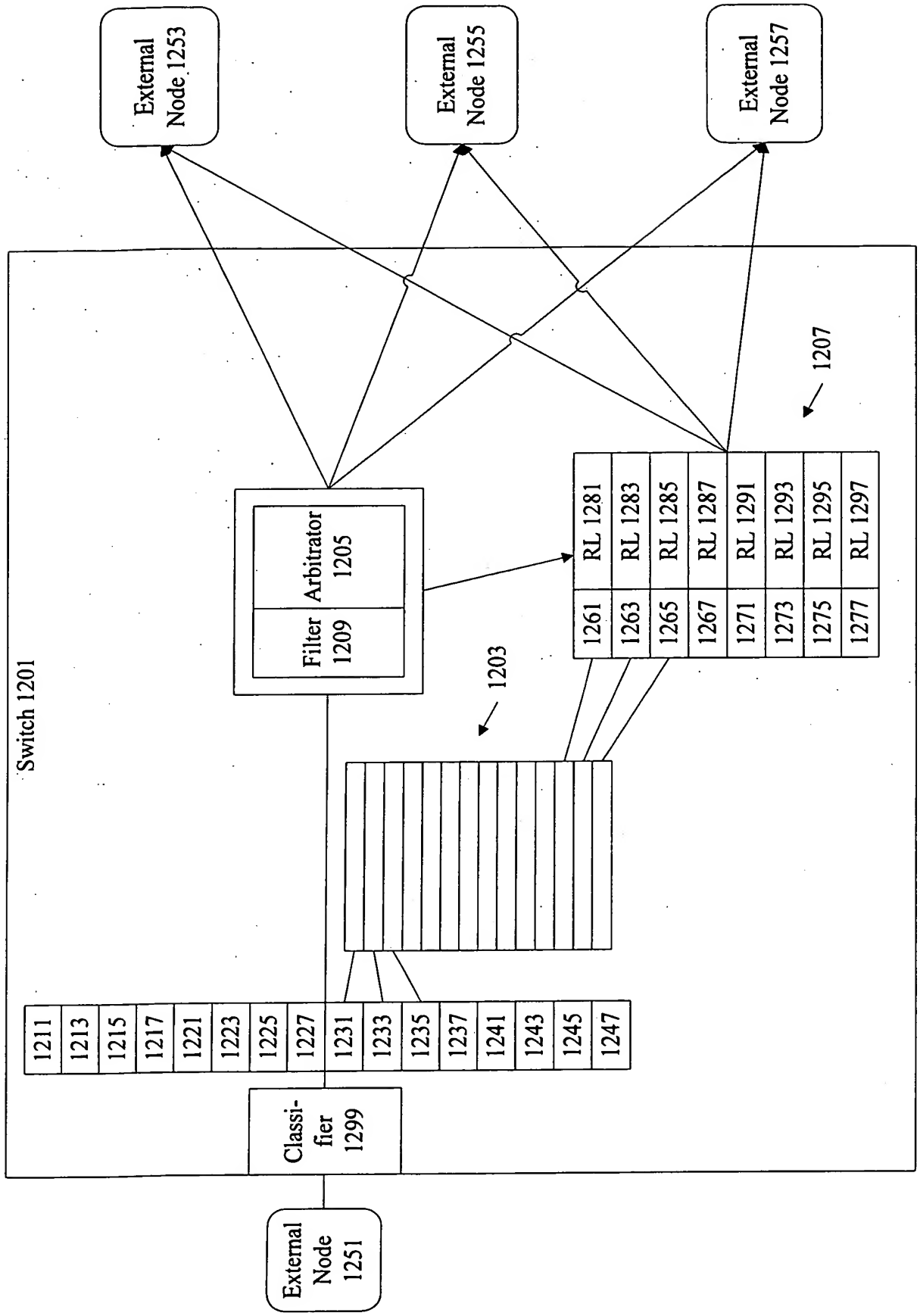

Forwarding Quench Message
1101
Receive A Quench Message At A Congestion Control Switch
1103
Extract Flow, Priority, Source/Destination, Port, And Other Parameters For Congestion Control
1105
Are There Any Other Congestion Control Switches Before The Destination?
No
Yes
1107
Queue Frame For Transmit Scheduling Using Fibre Channel
1111
Store Quenching Parameters Relevant For Congestion Control In Filter
No
1109
Is The Quench Message An Edge Quench?
Yes
1113
Drop Allowed Rate For Associated Rate Controller By Half If Edge Quench, To Zero If Path Quench
Done

Figure 12


External Node 1253
External Node 1255
External Node 1257
Switch 1201
Arbitrator 1205
Filter 1209
1207
1203
RL 1281
RL 1283
RL 1285
RL 1287
RL 1291
RL 1293
RL 1295
RL 1297
1261
1263
1265
1267
1271
1273
1275
1277
1211
1213
1215
1217
1221
1223
1225
1227
1231
1233
1235
1237
1241
1243
1245
1247
Classi-fier 1299
External Node 1251

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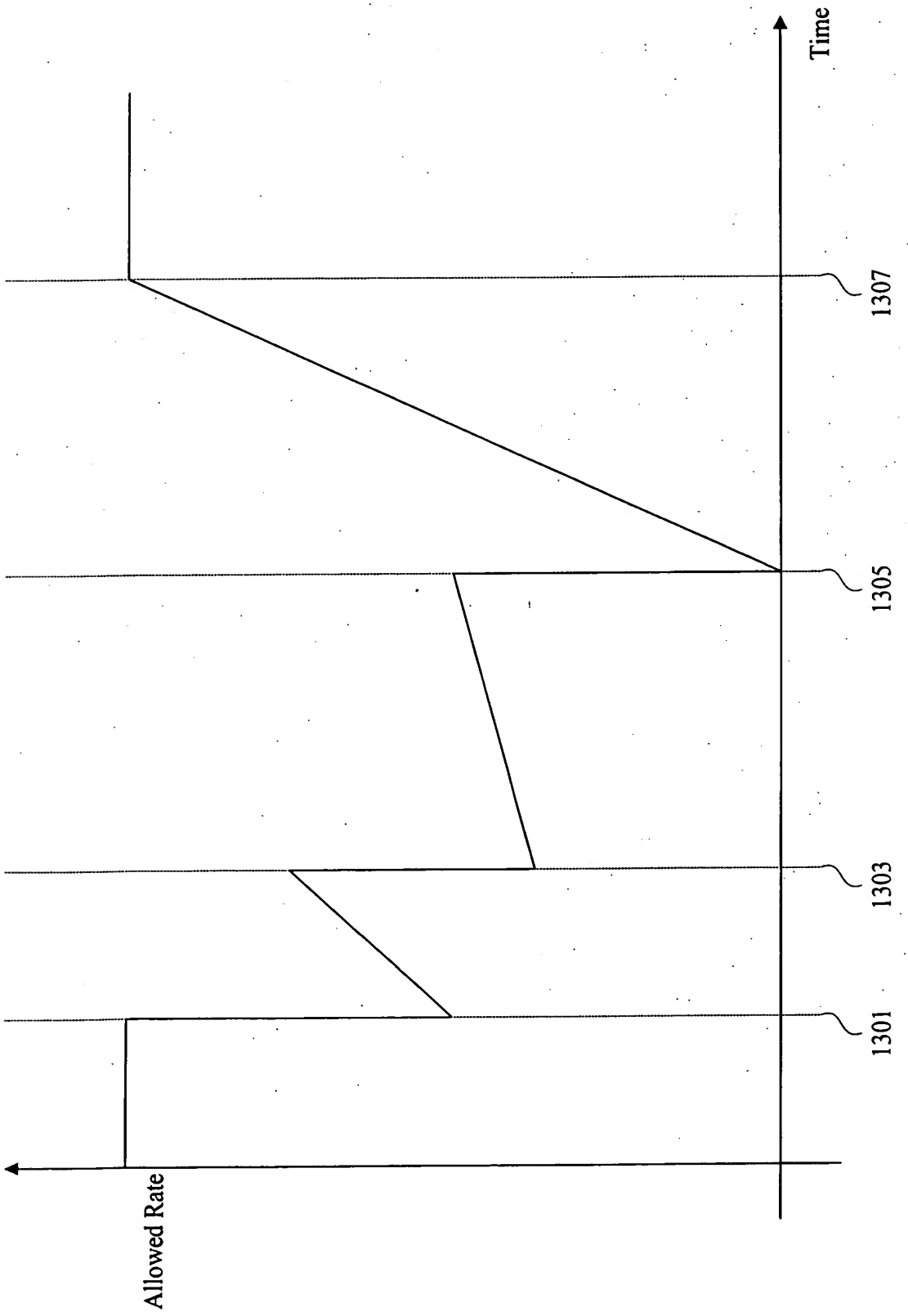
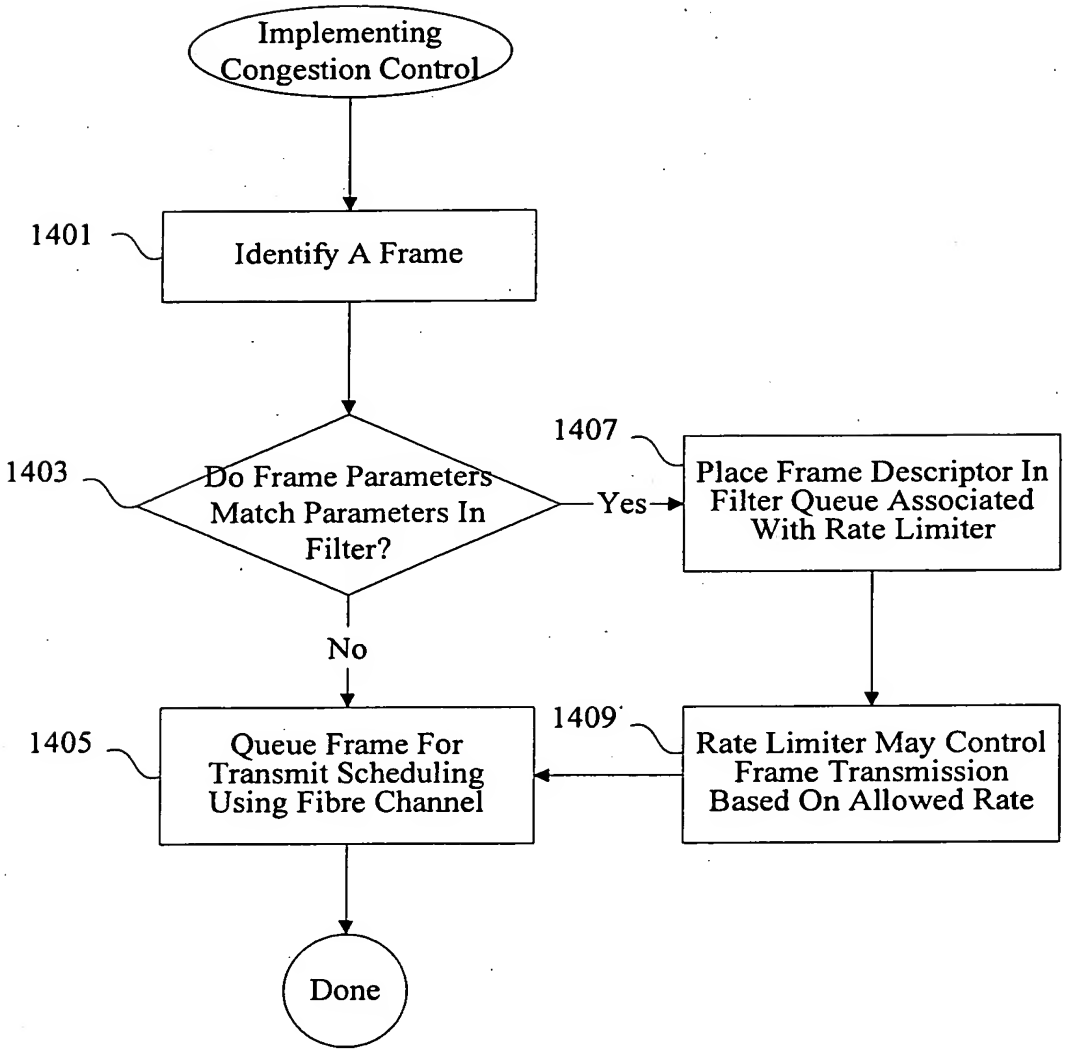


Figure 13

Figure 14


Implementing Congestion Control
1401
Identify A Frame
1403
Do Frame Parameters Match Parameters In Filter?
Yes
1407
Place Frame Descriptor In Filter Queue Associated With Rate Limiter
No
1405
Queue Frame For Transmit Scheduling Using Fibre Channel
1409
Rate Limiter May Control Frame Transmission Based On Allowed Rate
Done

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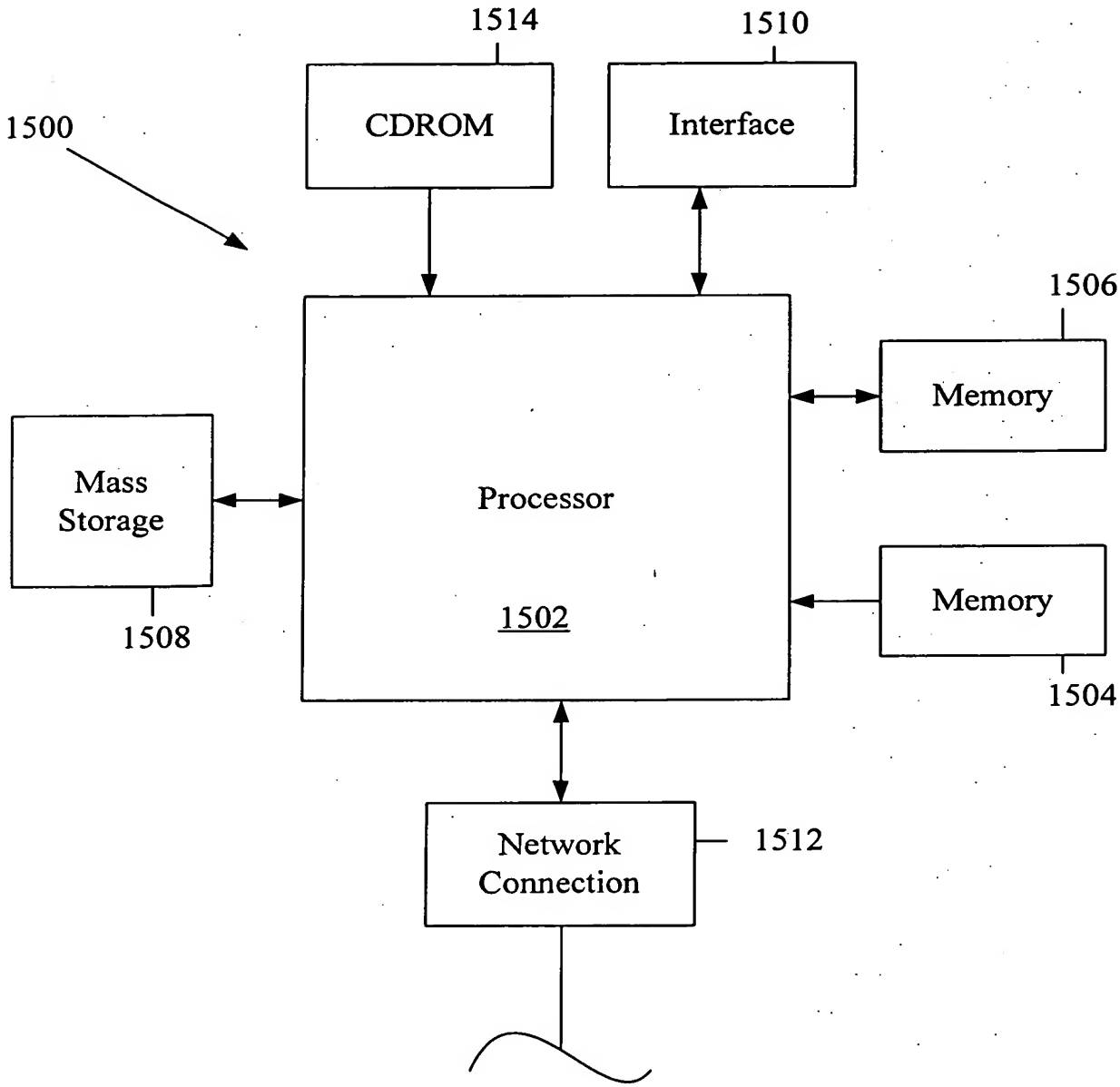

Figure 15